IGF 2023 WS #307 Data Governance in Broadband Satellite Services Kyoto – 12 October 2023

JOANNA KULESZA: Welcome to Session 307. And this time we encourage you to join us to discuss data governance in broadband satellite services. That's the thing we have chosen for this panel.

The group of presenters we have managed to to complete for this panel has been working on satellite connectivity and Internet access for a while. We will go through the introductions in due course. For this specific session, we have decided to focus on data these new technologies that support Internet connectivity all rely on what has been referenced as the new oil so we are very much looking forward to discussing that specific aspect of Internet connectivity and satellite infrastructures.

My name is Joanna Kulesza. I work as an assistant professor of international law at the University of Linz in Poland. For the past year and a half, together with my co-lead on an ISOC Foundation project we have been working to better understand the legal framework behind low earth orbit satellites and Internet connectivity, and Berna Akcali Gur is one of the panelists on this project as well.

We have managed to put together a panel of excellent speakers, whom I'm going to kindly ask to introduce themselves in due course for the purpose of time. Our scoping questions for this session do include both the technological aspects of low earth orbit satellites and Internet connectivity, and that is a kind request to our first two speakers to shed some light on that specific theme. We will then move forward to better understand what are the regulatory constraints behind using technologies like SpaceX, but I'm certain our speakers will emphasize that that is by far not the only company that is offering satellite infrastructures for Internet connectivity. And then, we will look at regulatory impacts that the governments are trying to cause within different jurisdictions, as well as the civil society feedback to the possibility of deploying new infrastructures and regulating managing processing the data that flows through them.

I have kindly asked our panelists to present for 7 to 10 minutes, as already said, we have quite a rich agenda. So, without further ado, I am going to ask them to take the floor, and then we will move directly into the q&a, so if our audience members do have questions or comments, they are more than welcome to either post them in the chat, I will be monitoring the chat, or simply wait until the q&a session. It will be moderated in the room by Berna Akcali Gur, and we will give you ample time to share your feedback.

With this, I hand the floor over to Dan York, who has been leading a dedicated project within the Internet Society on low earth orbit satellites, completed with an insightful report. I am certain that we will be provided with a link to that report in due course, Dan has been working for ISOC as the Director for Internet Technology, so we could ask for no better speaker than to then then to give us an introduction into satellite infrastructures and Internet connectivity. Dan, thank you so much for joining us, the floor is yours.

DAN YORK: Thank you very much, Joanna. And thank you for everybody who's coming in attending this session, whether you're in the room there in Kyoto, or online, wherever you may be. This is a fascinating topic around data governance. I could go off on any topic, but I've been asked to kind of focus on the technology side, and set the stage to make sure we're all using the same terms, working in the same kind of space, and working with that.

So, to begin with, I work for the Internet Society. I've been there for 12 years. I'm currently the Director of Internet Technology, I have a focus around... one of the aspects is connecting the unconnected, and how do we do that using low earth orbit satellites, among other technologies?

[At the Internet Society, we are] all focused on the Internet for Everyone, and how do we bring those people together?

To begin any conversation on satellites, we need to talk about orbits. This is the critical part to understand what's going on right now, and why there's so much energy and excitement. We've had satellites that have been providing Internet access for decades now, almost all of those have been out at what is called geostationary, or geosynchronous, orbit out at around 36,000 kilometers away from the Earth. These are large satellites, typically size of a large bus, or something bigger, they cost millions of dollars, many millions of dollars, sometimes they take a long time to get out there, but they provide service for sometimes 15, 20 years or more. They can provide decent bandwidth, the challenge that they have is, they are so far out, that the the amount of time it takes for a packet to go from the earth out to the satellite and get back can be 600 milliseconds, 800, 900, a second, or even more. The challenge that has is that, in today's world, when we want to have video conversations like this one, you need something with a much smaller amount of what we call latency or lag. This is where we start to look at the other areas.

There is a medium Earth orbit, which is between 2,000 and 36,000, and there's a range of things that are in there. There is a provider SES, which has the O3b satellites that do exist out in that kind of range. They are a little bit closer, have a little bit better latency, but the energy, the excitement, is all down in this space below 2,000 kilometers, which is the low Earth orbit, or LEO as we say here, L-E-O, however you want to call it. This is where the space stations are, this is where so many of our satellites are, imaging, sensing, everything else, all of this is happening in this space.

Now, part of what goes on, and why we're getting into this, is that the farther away you are, the bigger the range of the earth that you can cover. So, you can go, and with, out at the geosynchronous area, you can have three satellites, and you can be able to cover basically the entire earth, by positioning them in different areas. If you're in the middle Earth orbit, some of the systems there can do maybe 20 or so. They're orbiting, they go faster, etc. When you get down into the LEO area, you need a lot of satellites because they're moving, are constantly in motion around there. OneWeb, which is now Eutelsat OneWeb, is around 1,200 kilometers away from the Earth, and they have about 600 satellites, SpaceX, with their Starlink, and Amazon Project Kuiper, and others who are in this play, are a little bit lower, they're about 500, 500 to 600 kilometers away from the Earth, and they need about 3,000 satellites to go and cover it. So, it's a different scale that you see here going on.

These are this world of LEOs, or low Earth orbit satellites that we see around here. What's happened, is driving this interest in LEOs, is this need for this high speed, low latency connectivity. We want to have connections like this, we want to be in gaming, we want virtual worlds, we want

eSports, we want, you know, fast connectivity to be able to communicate and connect with people. The challenge is that just hasn't worked in the past with GEO.

But, the thing that's driving it is this massive reduction in costs. These LEO satellites might be the size of a car, or even smaller in some cases. They can be mass produced and rolling off production lines. They can be sent up in rockets with 50 of them of amount of time. And, those rockets can be reusable now, as we've seen with SpaceX. So, there's this massive change in the way that we're able to go and deploy rockets and things that are out there.

There are three parts to any of these systems. One is this constellation of satellites, that's the thing we all think about when it goes up there. Each of them are launched at different altitudes, there's different what they call orbital shells that are around. There are different ways. There's also the user terminal, is the language used in satellite-speak, the ground terminal or something. Normal, I mean, people just out there, often just call it an antenna, or a dish, or, you know, that kind of thing. But that's the piece, that's the hardware that you use.

The big difference that's happened is that you need a fancier antenna. With a geostationary satellite, you can just put an antenna on the side of your house, or top of the house, you have pointed out the satellite and it's done, because that satellite is fixed over a certain part of the earth as it rotates. You can just put the dish up there, and that's what you see in all over the world. Well, that doesn't work when your satellites are moving at a high pace, and they might only be over the earth in view for 5 or 10 minutes.

So, you need these new antennas that are electronically steerable, phased array, lots of different words for them. But basically, they're the things that you see if you've seen anything with Starlink, they look like a pizza box or something. Amazon Kuiper has similar ones. OneWeb has some similar kinds of ideas. The companies that are selling direct to consumer often accompany that with a Wi Fi router, or something else.

And then, there's also ground stations, and these are the receiving end of where that signal goes up to the satellite, comes down to a ground station, connects out to the Internet. Now, these are different for each of the providers, OneWeb's ground station is different than SpaceX's, which will be different than Amazon Kuiper's, which is different from ones used by Intelsat, or one of the other Geo providers. They're all their own separate space in there, but they need that ground station to connect to.

Now, this is something, and Larry's going to talk a little bit more about this in a bit, but this is something that's changed a bit. Historically, you needed to have a ground station in each country, for legal reasons and things. But also, within a certain range, the satellite had to be able to look down and see the ground station. So, you had to have the maybe every 900 kilometers, something, you had to have them spaced out around the Earth. And this is why, because you would have this user terminal, set the dish, connect up to a satellite, bounce down to ground station, and go out to the Internet. Of course, in the LEO space, it might look a little bit more like this, some of your packets would go to one satellite, the other ones would come back there.

One of the big changes, or revolutions, in this space, is what if you're not in range to a local ground station? This is what Larry's going to talk a little about, is this idea around what are called inter-satellite lasers, which allow you to go and connect up to the satellite, bounce across the mesh, and then drop down to a ground station, and then connect out there.

Now, SpaceX has demonstrated this already, when you look at things, such as, they did some experiments in Antarctica with Starlink dishes there that connected up to the Starlink mesh, went across the constellation, and dropped down to a ground station somewhere else. There are no ground stations for this in Antarctica, it was connecting up and across.

It was also demonstrated in the Iran protests, when the US government and others asked Starlink to turn on Starlink access in that country of Iran. And they did. There aren't any legal ground stations in Iran, they were taking that data up into the satellite constellation, and then dropping it down somewhere, into some other ground stations there.

There's a range of different kinds of data flow tech issues we could talk about here, about where does the data get dropped down to? Who's in control of that? A lot of different topics around that that I'm not going to get into. But we'll talk more about that.

Just quickly, some of the concerns or things that we have to think about are...

Affordability. Can these systems really be affordable for the people who need them the most? There's a bunch of different business models that are being brought in here. Will they have the capacity to support all that we need? Certainly, we've seen in some areas, they provide tremendous capacity for everything you need. When you get into more densely populated areas., actually, you wind up with having challenges in some of this.

Will there be competition? What are the business models? Right now, one of the biggest challenges is simply deployment. There's a limited number of providers, really only SpaceX right now, who is able to go and launch satellites up into space at the pace that you need to launch, because you've got to get 1000s of satellites up in low Earth orbit. And, because they only have a five year lifespan, you need to keep replacing.

We're in a weird spot where a lot of the other launch providers, Arianespace, United Launch Alliance, Jeff Bezos's new Blue Origin, they're inbetween launch vehicles, like the Ariane 5, there's no more rockets, and the Ariane 6 hasn't been deployed yet. There's other pieces like that. So, we're in a weird spot. One of the big challenges is just getting the satellites up there in the first place.

There are other concerns: security, privacy, standards, what standards are being used. Now, if you use a Starlink connection, it works with all the typical Internet standards, those are all open. It works across there. How they're routing inside their infrastructure is right now primarily proprietary.

There's issues around space, debris, lots of things that come into these kinds of spaces. We don't fully understand the sustainable business models. There's questions around the environmental impact of all of this, what will it be the impact on astronomy? There's a lot of open questions.

So, that's really one of the reasons why we need to have sessions like this, at the IGF and other places, is because this is an industry that is still in its infancy. We need to understand a bit of this.

And, I will put a point on the urgency around this. The next several years are going to be very critical, because there's a lot of people launching these systems. Starlink has already launched much of its Generation 1, its first phase, which will ultimately be about 4400 satellites. They're in the process of launching the first part of their second generation, which will be 7,500 satellites, growing to around 30,000 satellites. OneWeb has completed their first phase of around 600, but they're going to be launching more. They're on the books to do that. Amazon, just last week, launched its first two demonstration satellites, but it's on the track to launch another 3,200 over the next couple of years. China is proposing their own constellation, which will rival Starlink's, and about 13,000 satellites. The European Union is looking to develop its own IRIS constellation.

If you look at the numbers that are filed with the ITU in terms of satellites, it's conceivable that, over the next four to five years, we could have 40, 50, 60, maybe even 90,000 satellites orbiting the

Earth. And this is just the Internet access ones, not even thinking about imaging, or sensor networks, or other stuff. So, it's a very crowded space up there.

Data flows are going to be a big part of thinking through how all this works.

And, with that, I will just say, Joanna's right, we did have a report that we issued last year, we're still working on th at. You can get it at InternetSociety.org/leos, where we talk and frame a lot of these kinds of issues.

And with that, I'm going to turn it to Larry to dive into lasers a little bit more.

LARRY PRESS: What I'm going to talk about, as Dan said, he gave a great overview, I'm going to be very focused in kind of a narrow niche, which is optical laser communication between space in the ground, not even.. just have one slide on the inter-satellite links, and the reason I'm doing it, is because I think it may have a significant impact on this Sustainable Development Goal, number 9 in particular.

So, you can see the picture on the right. It depicts a few satellites in the sky in space. The kind of narrow lines between them are inter-satellite thanks, that Dan talked about, and then those thicker lines depict laser links, communicating with ground stations, or gateways on the ground. I'm going to focus my my talk on the links to the ground stations.

I only have one slide... Let's see. Here you go. One on the inter-satellite links. Dan said SpaceX was the first. They now have about 8,000 optical terminals in orbit, and they have recently begun launching their second generation, which go faster, they go up to 100 gigabits per second.

As you can see, each satellite has three terminals, two of them point forward and backward in the same orbital plane as the satellite is going. The third one can go left or right. And I'm not sure., who knows, but I think it can perhaps go down, point to the ground, and that's what we're going to talk about now, satellite communication between the satellite and the ground.

Why are we concerned with, or excited about optical communication? Right now, it's radio frequency communication to those ground stations, and optical has many, many advantages. I've listed them there on the left, I'm not going to read them to you. Maybe the most interesting is license free, there is no problem with getting with interference with spectrum that there is with a radio frequency. It's like a laser pointer, and RF is more like a flashlight that kind of spreads out,

the signal gets diffused, and there even some little side signals that completely don't go to the right place.

What's not to like? It's the atmosphere, things like clouds and rain and stuff, get in the way of optical signals. They can distort them, and cut back their power.

So, the pay off would be really great, as was just illustrated, and, for that reason, many really smart people and business people are working on it. I'm going to run through really quickly, five groups, I'm not going to say much about any of them, but I will have links, a lot of links, that you can follow up on all of these.

Okay, NASA has been doing it since 2013. They've got many projects, many experiments with space to ground communication, optical. I'll just say this one is 200 gigabits per second, from a little CubeSat, from space to the ground. That is way fast, that's 1000 times faster than we're used to. And that's the kind of payoff that will come from this stuff, if it works.

Universities are doing a lot of experiments and research. This one's interesting. It's from the Federal Technical University in Switzerland. They've got a deal where they've got satellite terminal up here on top of a mountain, and they've got a terminal down here, at their Institute, the whole distance depicted there is about 53 kilometers, and you can see that it's going through some of this stuff, like turbulent air, and it's over a lake with water vapor, the kind of stuff that screws up laser transmission in the atmosphere. And, with the adaptive optics, that they have a little tiny chip with 97, 90 adjustable mirrors, that can make adjustments 15,000 times a seconds, things like that are inconceivable, but they exist.

They're also working on modulation schemes, way to encode the ones and zeros into the signal. And so, they've been able to achieve like .94, almost a terabit per second transmission rates. They say they're working on new modulation schemes, new software, to encode things and make it go faster, and it can be scaled up to 40 channels. So, that would be an incredible amount of data coming in from space.

The second University one has to do, not with the data transmission rate, but with being able to track the satellites, like Dan says, as they move across the sky. What these guys have done is put up a drone, and it goes back and forth at 65 kilometers per hour, but that simulates the sort of one degree per second that a satellite in low Earth orbit would transcend. And, in fact, they have no trouble tracking it, and transferring data from it.

The military, no surprise, is really interested in this stuff. One most really interesting thing is the Space Development Agency, it's part of the Space Force. They have what they call the Transport Layer constellation. It's going to have between 300 and and more than 500, they haven't really decided yet, satellites. These will have laser links between the satellites, and also space to ground laser links. And, a key thing is, they have a real philosophy of working with commercial suppliers. So, that's really an interesting one to watch.

Speaking of commercial suppliers, I think the most interesting one is a company called Aalyria. It's a startup, they acquired their intellectual property for two products from Google. It's really a bunch of guys that used to work at Google. The products are called Spacetime and Tightbeam. Tightbeam is an optical communication technology, and Spacetime is sort of a network management system.

Let me tell you about Tightbeam, because that's what we're talking about. Like the guys in Switzerland, they are working on a hybrid approach, and it sounds real similar. They have adjustable mirrors and clever software. They say they are getting now... they also do tests from a mountain near their headquarters, and they're getting tests that are going at 400 megabits per second, and so, if you have four of those... Yeah, you can put channels together.... which gives you 1.6 terabits per second.

The reason I want to bring them up in this context, on the right hand side, you see a couple of slides from a demonstration that they've done,put together this, I'll tell you a little bit more about it in the next slide, but one of the things that demonstration, or the software takes cognizance of, is the surface temperatures on the earth, and atmospheric conditions, and that enables Spacetime, which is their other product, which does the routing and whatnot, to route around the kind of bad atmospheric conditions I spoke of before.

Let's look at Spacetime. These are again from the same demo. You can see the scope of this thing. This is a demo of a hypothetical network that reaches from the Moon to Earth. And if you zoom in, you can see it's also working on ships at sea, and airplanes in the air, and of course, satellites in orbit. So, it's a very comprehensive, kind of a network operating system, for controlling, both fixed and mobile assets, and the links between them, on the Earth, and wherever they are, space, outer space, deep space. They definitely have deep space in their their planning. The guys sent me... I had a little exchange on Twitter yesterday. Yeah, they're heading for Mars, not just the Moon.

This project is super comprehensive, but it's also it's reminiscent to me of the ARPANET back in the old days. And, I list some of the reasons here, it's the software is open source, they're trying to do

standards, networks can federate and access each other's assets. It really sounds both ambitious, and like the ARPANET, but a 1,000 times more ambitious. I would strongly advise you to watch the demo these slides came out of.

Okay, another commercial thing...ooh it says University, it should say commercial, I'm sorry.

Another commercial company that's worth paying a little attention to is Intelsat. They're one of the traditional geostationary satellite operators, that Dan talked about, but they are doing interesting partnership products. They are working with SpaceX to test space to ground optical communication, And with OneWeb on airline connectivity, and they are going to use the Aalyria operating system. So, keep an eye on them.

Okay, I mentioned that China.. Well, you have to talk about China these days. Dan mentioned Guowang, that's really something, but you're going to have a hard time launching all those satellites, before Elon Musk is sitting on Mars. But, at any rate, China is behind, seems to be behind in this optical communication between space and the earth. I can only find these two projects, just kind of looking around for this talk. I talked to a friend of mine, who's [inaudible], who's in China, and knows everything about the Chinese Internet and space business, and he couldn't add to this. They don't seem to have much going at present.

Okay. And there's bad news, though. That was a lot of good news, and a lot of people, smart people, put a lot of energy into this. The bad news is, there are no optical ground stations anywhere, and so that's going to take a bunch of investment. One approach is, some of it can be done by augmenting some of the existing RF gateways that are that are already existing. If they're in good geographic locations, that might make sense, because they already have the real estate around the ground station, they have power coming in, most important, they all have high speed Internet connectivity at their locations.

If you look at this map, the green pinpoints are the SpaceX gateways. In North America, there's 75 of them. You can see though, that some of these gateways are in southwest United States, some are in northern Mexico, some are in Arizona, as in Arizona, in Australia, places that might make suitable locations for an optical gateway.

The other thing, though, that won't be enough, you'll have to construct new gateways. One would try to put them in arid regions, locations near centers of demand, and locations that have already high speed Internet, terrestrial connectivity. Observatories come to mind as likely places to have them, they have a lot of those characteristics,.

But, it's going to take a lot of money, careful analysis, to build that infrastructure. out, if this stuff takes off.

To come back to the Sustainable Development Goal number 9, I just want to talk for a second or two about Africa. Right now, in Africa, SpaceX has only two publicly known gateways, so they could use some connectivity. They have an advantage in that the brown, the sort of arid spots on this map, tend to be in the north and the south. I know there are others. That is an advantage because the satellites have inclined orbits, they don't just go around the equator, but they kind of go north and south, some of them are almost go over the poles. What that means is these inter-satellite links are going to be more efficient for them, for north-south links, than they are for going east and west. So, thatlooking that's looking good for Africa, you can imagine some gateways in the north, and some gateways in the south.

The other thing is seasonal variation. Obviously, in the northern hemisphere, it's different than in the southern hemisphere, and by having this kind of north, south, having these two areas that are in the same longitude, gives them another advantage. They will have good weather at least somewhere, or maybe in both places, at all times.

Now, I've given you kind of a really fast, positive view of the whole thing. Here's a reality check this quote, "Personally, I don't think optical to low Earth orbit is really going to go." And, the guy that said it is the president and CEO of KSAT, which is a Norwegian company. It's an established optical ground station company. They tried an optical ground station in Greece in 2020, and it failed commercially. So, this is not a slam dunk, there are tons of investments needed, and there's tons of research and development that needs to be done.

Okay, that's about what I was going to say. You can see here, my email address, and place where I talk about this stuff a lot. If you'd like to see a copy of those slides, which have tons of links, just send me a request.

Here's a frequency terminology cheat sheet for those who would like it.

And, that is the end.

JOANNA KULESZA: Thank you so much, Larry. That was a lot of information. We particularly appreciate the developing countries focus, that is one of the themes we have been exploring throughout both of the projects, the one that Dan mentioned, and the one that our next speaker

and myself have been working on. So, it's most appreciated that you have provided us with this very broad technological overview, and my sincerest thanks to Dan for his lasting support, and yet another great intervention.

With that, without further ado, I'm glad to hand the floor over to Professor Berna Akcali Gur from Queen Mary University in London, who's a convener in outer space law, which brings us to the regulatory component of this panel, again, with a kind request to our speakers to try and limit their intervention to 7 to 10 minutes, I'll hand the floor over to Berna, with a kind request for a brief review of whether all of these wonderful novel technologies are actually regulated,. and, if so, if there is a data regulation component that you might wish to focus on. Berna, the floor is yours.

BERNA AKCALI GUR: Thank you, Joanna..

I'm delighted to be here today to discuss data governance in broadband satellite services, I am joined by an esteemed panel of experts who bring a wealth of knowledge and experience on this topic. As you said, my task is to delve into the regulatory aspects of satellite connectivity, and hopefully provide you all with some insight.

So, the megasatellite constellations attracted wide scale global attention on 26th of February 2022, two days after the Russian invasion of Ukraine started, while Elon Musk, SpaceX founder and CEO, responded to a request from the Ukrainian Deputy Prime Minister, confirming on Twitter that Starlink satellite Internet service has become active in Ukraine. This news came after the cyber attack by Russia on another satellite system, owned by ViaSat. The primary target of cyber attack is believed to have been the communication lines of the Ukrainian military, as it was just one hour before Russia launched this major invasion of Ukraine.

But, the impact was more extensive. It affected 1,000s of Internet users and Internet connected devices, including the wind farms in Central Europe. It is unclear whether the spillover was unintentional. The solution for the disruption was another satellite system, Starlink, a new megaconstellation, then.

Until this time, the provision of broadband Internet had been considered an experimental alternative to undersea and underground telecommunication services, but suddenly it became the communication lifeline for a war torn country.

As expected, this received a lot of press coverage. The celebrity status of the company owner also contributed to this. Around this time, we saw it being used in disaster zones, such as the flooding in northern New South Wales, and remote villages in Tonga, after volcanic eruption and tsunami.

Soon after they launched services in Ukraine, an uprising in Iran started. The government applied restrictions on Internet access, so the protesters called Mr. Musk to help restore their Internet connectivity. This time, he wasn't able to help, at first, then he was, but achieved limited reach. It wasn't because Starlink services did not have coverage of Iran technically, but primarily for legal reasons. There were US restrictions for providing services to Iran, and Iranian government had not authorized Starlink to provide services within their borders.

So, in both of these examples, the company acted in a manner that reflected the preferences of its home state. So, in the first year that this company started providing services, it didn't really shy away from making political choices.

As we all know, the concerns regarding cross border data transfers, and data governance, have a geopolitical dimension as well. In that sense, relying on this infrastructure for transferring, storing, or processing data, is very much perceived as relying on a US infrastructure for connectivity and data transfers. As one would expect in the current state of affairs, Russia and China have already declared that they will not allow the provision of satellite broadband by a US service provider, and cited cybersecurity as the main concern

Confirming the prevalence of data governance concerns, in a survey Joanna and I conducted for our ISOC Foundation funded research on the global governance of satellite broadband, the respondents chose data privacy as one of their primary concerns. In another question, they chose an international treaty on data flows, and standards development approach, as the best way to tackle concerns regarding global data value chain being monopolized by a small number of LEO broadband companies. This survey was more than a year ago, we are still in the early stages of this technology, so we'll see what the future brings and how the data governance regulations takes shape.

Now, so far, I have established two things. There's a geopolitical dimension to the use of satellite broadband, and data governance has started to be associated with its use. So, what sort of measures can countries employ to address their concerns?

Some EU countries, and UK, have already licensed Starlink to provide services, although they have, or plan to have, their own satellite systems. The plan is to create a competitive market, but all

licensed service providers are expected to comply with the domestic data governance regimes. On the PowerPoint you see Starlink's commitment on its website to comply with the GDPR, for its customers in the EU.

Major spacefaring nations have also embarked on projects that will give them their own satellite constellations. A good example is China and the EU. The justification of these ventures goes beyond data governance, but it is a significant factor.

So, what is the exact contours of domestic jurisdiction over satellite services? While the provision of satellite services in a particular country is subject to that country's laws and regulations, and the framework covers much more than data governance, the satellite companies need to comply with all, to be able to provide services in a particular jurisdiction.

The ground station? For that the companies will need authorization from each relevant jurisdiction, even if they do not need to establish one technically, they may be required to.

They will also need to obtain a license to use the frequency spectrum. The frequency spectrum is coordinated at the international level by the ITU. However, at the domestic level, it is a national regulatory agency that assigns them, of course, in compliance with what is agreed at the ITU.

If the companies provide their services directly to consumers, they will also likely need an Internet service provider license, which will include the license for the use of terminals by consumers.

The importation of their user terminals will also be subject to the import requirements of the national authorities.

The states will want to check the conformity of their new measures with their commitments in their trade treaties.

While satellite connectivity is not new, and the fact that it is being provided by via megaconstellations, does not mean existing regulations do not apply. Regulators are updating the provisions to address the unique challenges of megaconstellations, but, essentially, the existing regulatory framework is applicable.

I hope this brief explanation gives you an overall idea.If you would like to read more on the topic, please check our website, I'll provide the link in the chat, where you can find a detailed report on the subject, and shorter police papers for governments and civil society organizations.

Thank you.

JOANNA KULESZA: Thank you, Berna. Wonderful, thank you very much, indeed.

There seems to be a lot of regulation on both telecommunications and data. Yet, when we look at these new advancements and infrastructure, the question is whether these are sufficient, whether they are relevant, whether we are back to national laws or national regulations, and whether the multistakeholder model still matters with regards to Internet connectivity.

And, with that question, in terms of how developmental help should be provided to countries who are still deciding on how to expand Internet connectivity in their jurisdictions, I turn the floor to our next speaker, Dr. Uta Meier-Hahn, who is the advisor for digital technologies at the Deutsche Gesellschaft für Internationale Zusammenarbeit. I'm very much looking forward to Uta discussing the developmental context of new technologies supporting Internet connectivity, some views in particular. I know you have been working on these topics, so I'm very curious to hear your perspective. Uta, thank you for being here, the floor is yours.

UTA MEIER-HAHN: Thank you so much. So my name is Uta Meier-Hahn, and I am with GIZ, which is a public benefit federal enterprise, so we support the German government, and a host of public and private sector clients, in achieving their objectives in international cooperation. GIZ, some may know this or not, but we work in around 120 countries around the globe on a wide variety of areas, and that also includes fostering digital policy for sustainable development.

So, why do we, as an organization in the field of international cooperation, work on LEO satellite, or satellite Internet in general? Isn't that this expensive niche technology, with limited capacity, that will never ever be the Internet for you and me? These arguments I keep hearing, and they may sound and be valid, so I feel like we need to do some clarification about what we can, and what we cannot expect from LEO satellite Internet.

Here I would like to make four points. The first point is about time, which we don't have, because Internet connectivity is widely recognized as a catalyst for development. This means that regions with access to better Internet connectivity are progressing at a relatively rapid pace compared to those without. This means again, in other words, that the digital divide, or divides, grow larger with time. Therefore, it's important to not only increase meaningful connectivity overall, but to do so quickly. This is where LEO satellite, or broadband from space, may come in.

It requires minimal terrestrial infrastructure, as which we've just heard, which is heavily under development. Because of that very feature, it could bridge digital divides faster than other connectivity solutions. So, this, to my mind, is not a discussion about either / or, it's not about either fiber and mobile infrastructure development, we must continue this obviously. But, we can complement those efforts with broadband from space, to make speedy advancements in connecting the unconnected. So, I find that there's the sense of urgency in the discussion about connectivity that sometimes gets lost in this discussion.

My second point is about robustness. LEO satellite Internet broadband from space can provide communications when traditional local networks may have gone down, as was just mentioned by Berna, due to conflict, due to natural disasters, due to manmade disasters, and having this type of connectivity from space in place can be like a safety net for critical infrastructures. I wish it was not the attack on Ukraine that would serve as an example, over and over, for the criticality of satellite Internet for governmental communication in conflict.

My third point is about the market, the market for Internet connectivity solutions. That point is very simple, alternatives for connectivity enlarge the market. Depending on the business models of the providers, which vary as we have heard, choice may arise for end users. That, again, can stimulate competition. And, if some other factors about the local connectivity situation and the ecosystem on the ground are given as well, affordability of Internet access can increase, not only for the users of broadband from space. This is a thesis. I encourage us to monitor the pricing level development in regard to this, empirically.

My fourth point goes more directly to the global dimension of the governance of LEO satellite Internet. It has been alluded to in the previous talks. All global citizens can be viewed as stakeholders in broadband from space, because they share the risks that are associated with this technology, like the serious damage that could occur from space debris, the environmental cost of launching rockets, and others. At the same time, there is, and probably there will be, only a handful of spacefaring nations who host industries that are actually operating, or are at the verge of operating, their own satellite constellations for broadband from space.

What does this mean? It means that, for the foreseeable future, the shared fate of most countries will be that they will remain customers of only a few providers of broadband from space, in very concentrated market. Also due to the limits of natural resources, such as space, such as frequencies, as long as the advancements with the... what Larry press was talking about, are not reality yet. So, these countries may ask themselves, if the connectivity that the providers of

broadband from space deliver, together as well as individually, comes at acceptable conditions for them?

Think of the digital policy quality of that type of connectivity. What do I mean by that? For one, every provider can be expected to comply with the rules of their own jurisdiction of origin, when it comes to how they treat the traffic, the data that they transmit, think of varying provisions for data protection, cybersecurity regulation, or frankly, surveillance. And then, of course, in addition, everything that Brenda has just mentioned with regard to the to the national regulation, but also the jurisdiction of origin matters.

And second, how can countries make sure that their connectivity is not terminated involuntarily, for instance, because the provider goes bankrupt, as we have seen that first wave of industry development, or because of political leanings, as Berna has just pointed out. So, I encourage us to think about the qualities of those policy underpinnings for LEO satellite connectivity, and that they matter.

Another aspect of this is the ability to switch providers easily, because being dependent on one company, or one man, puts customers in a difficult position, especially when broadband from space shall safeguard critical infrastructures.

That is an issue of global Internet governance, because the limited resources and orbital space and frequencies prohibit unlimited growth of this industry, so there's not better policy qualities by growth. There's a privileged position of a few, and that may give rise to a different notion of responsibility for these providers, as well.

So far, all providers offer their own proprietary hardware, as we've heard, for base stations and other equipment. So, working towards standardization and interoperability of equipment could go a long way towards preventing login effects. From what we hear at this moment, the European Union constellation IRIS Square, might be the first one to go into the direction of at least standardizing such hardware, we will see about the degrees of openness.

Let me close with a few empirical observations, so we don't only speak on this high level, because, in order for LEO satellite Internet to operate in a given country, as we've just heard, certain regulatory and institutional setup is favorable. However, this can be a major undertaking, specifically as the industry is developing so quickly, to put such a framework in place. That is why it appears beneficial for non-spacefaring nations to, on the one hand, document and share best

practices in order to, second, possibly identify opportunities to align their interests vis-a-vid providers.

To get an initial idea of where we are standing, we have looked at emerging policy environments in 10 of the partner countries, initially on the African continentw really just to get a very rough idea. I don't have time to go into much detail, so I will keep it very brief, but we found that countries are moving relatively quickly to authorize and license LEO systems. So, there is demand. Just to give you some examples, Ghana, Kenya, Mozambique, Nigeria, and Rwanda, currently all have commercial LEO services deployed in their countries. Tunisia is considering trialing new connectivity. Others are actively deciding what path to take, or what regulatory approach towards making requirements for businesses, etc. These countries are Senegal, South Africa, Tanzania, and Uganda.

One thing that will be important to notice also, that we found that all of these countries already participate in international satellite organizations, they are all WTO members. They have experience in negotiating issues at the relevant ITU conferences for world radio communication. They also have experience from previous satellite developments in introducing other satellite systems into their connectivity ecosystem.

What comes on top of that, with regard to the topic of our session, about data governance, is that they are all members of the African Union, which is actively examining issues related to data localization and cross border data flows, and just has recently put in a framework, that will serve to develop local policies around this.

These experiences will have provided most regulators and policymakers in those countries with years of experience, with skills to handle broadband from space, and I suggest that we build on this to fast track participation by others.

To sum up, if asked why LEO satellite Internet is important for development, I would answer LEO satellite Internet broadband from space can contribute quickly to closing the digital divide, or divides, it can serve to increase robustness of Internet connectivity, it enlarges the market for Internet provision, it is not going to go away for the foreseeable future, and so there's a lot of room for dialogue, for coordination, and for mutual capacity building, not only but particularly, among non-spacefaring nations, to shape satellite Internet to the benefit of all.

Thank you.

JOANNA KULESZA: Wonderful, thank you very much. That's exactly the intervention we were looking for, with the targeted approach to developing countries, and possibly recommendations to governments who are looking into deploying LEOs into their jurisdictions. I will save follow up questions for the q&a, and I'm certain there will be questions from the room, but thank you very much for highlighting that specific aspect of new technologies rapidly developing.

And, last but not least, please let me turn the floor over to Peter Micek, who's the General Counsel and UN Policy Manager within Access Now, an NGO that needs no introduction, but I am certain that, in his intervention, Peter will tell us more why Access Now might have an interest in data governance through low Earth orbit satellites.

Peter, thank you so much for joining us, the floor is yours.

Peter Micek: Thank you. I thank the other panelists for well laying out I think the facts as they stand now, and then some of the potential and current regulatory risks and opportunities.

I will come in with our perspective as a human rights organization. Access Now always needs an introduction. We're a global organization that defends and extends the digital rights of people and communities at risk. Our team members in more than 35 countries are encountering the emerging low Earth orbit satellite sector in a number of different ways, and that is what I hope to present a bit of.

I suppose I could start, with some of the risks that we see. As a human rights organization, we are very concerned about the consolidated control over this sector, as it stands now. Speakers have mentioned Starlink is the first mover, they have that advantage here, but it is up to the whims of the founder and controller of that firm, which which constitutes the industry right now, of available retail services. Our partners in Ukraine are very concerned that the entire nation, its military, civilians, and civil society, are dependent on this one company, and its egotistic owner, who seems to want to decide the outcome of the war, and there's really little that we can do about it.

So, civil society again, desperate for connectivity, eager to reach the sustainable development goals, and access, and exercise our fundamental rights, like freedom of expression, of course, we'll reach for any opportunities we can.

Access Now coordinates the #keepiton coalition against Internet shutdowns. This is a global coalition of more than 300 civil society organizations, fighting intentional disruptions of

connectivity. Inevitably, especially during longer term shutdowns, as we see in Sudan, in Kashmir and Myanmar, people look to the skies with hope... With hope that they can find a connection that will let them tell their story to the to the world, release the evidence that they've collected on human rights abuses and atrocities, tell loved ones that they're still alive, or that they need electronic money transfers. All the things that that we rely on for connectivity become compounded and pressurized in situations of armed conflict and desperation. Of course, people are going to look to satellites.

Unfortunately, though, this leaves us in the hands of very few Western companies, again. I think it's worth noting that the user terminals themselves do put people at risk. Another another risk here is that this consolidated control creates single points of vulnerability.

I know we don't want to get too much into cybersecurity,. but it was really exciting to see this summer at the DEFCON conference, a live competition, where teams actually hacked into a satellite, a low Earth orbit satellite orbiting the Earth, in real time. That was, I believe, the first ever such competition, where a satellite was hacked. In real time, for prizes. It was a LEO satellite launched on June 5, and if someone could put in the chat, it's Hack-A-Sat is the website that they use. I'll put it there.

A few things were learned from this competition, I think. One was, it was real interesting to see the satellite went dark for four hours as it crossed over Antarctica, I think it was, and so the teams didn't know if their hacks were successful. They had to wait until the satellite came back within reach, to both deliver their payloads, and extract the data. The winning team was able to hack into the the camera on the satellite, which is about this big, and take pictures of specific points on Earth, which was pretty cool to see, but underscores that there is active interest in attacking the cybersecurity of these.

And so, to the extent that we're dependent on them, with incredibly sensitive data, if we're talking about places where people are vulnerable, and at risk, which probably overlaps a bit with those spaces that are currently not covered by terrestrial connectivity, then that highlights and exacerbates the risks.

Same goes for these humanitarian contexts. Many operators are looking at ways to... operators of aid organizations, providers of humanitarian assistance, are looking to more efficiently deploy after natural disasters, or human disasters, and are certainly looking at these solutions.

But, again, are we are we sending them into a trap, where there's actually increased vulnerability and dependency on these systems that can be turned off, or deprecated, through through commercial phase outs, at a moment's notice?

And, yeah, the last point, I kind of want to get at was this pixelated regulatory picture. We've seen the number of different potential frameworks that apply. I've mentioned international humanitarian law, there's, of course, space law. Out here in the convention center Expo, there's actually a high altitude platform system, a giant wing, that's being demonstrated this week, that's not a low Earth orbit satellite, but it is meant to fly for six months at a time on solar power at about 62,000 feet, maybe somebody can do the metric monversion, but it's really exciting to see. People are excited about these. But, that would would bring in yet another... I think aviation law would apply there.

Telecoms law? I think in various ways, these firms are more akin to the telecoms that we know. In other ways, they're more akin to fly by night, top of the stack, application and session layer web startups. It's interesting to see how these different analogies, and different bodies of law, might apply, and regulation might apply, or might not be adaptable.

But, as civil society, again, in this pixelated regulatory picture, we don't know where to engage, we don't know how to engage. We don't have access to the International Telecommunication Union, as many companies and governments do. We're not adept at Space Law fora. I don't know where the intricacies of space law are open to civil society input,

I do want to finish by talking about the data protection and privacy at issue. The positive is that human rights are universal, right? Universal. These rights that are interdependent, indivisible, they've got laser links between all the human rights already set up. This is a framework that we can depend on, and that we should utilize, and it's no different for the fundamental right of data protection. The fundamental right in here is in the individual, where they are, where they reside, and, to the extent of processors of this data touches and concerns tthe EU, then the GDPR will apply to any personal data that's flowing, and we can assume that it will.

And so, I think it behooves this sector to put a foot forward, and to engage in civil society organizations, like Access Now, like EDRi in Europe. Across Africa where data protection, the Malabo convention is growing, [inaudible] Convention 108 already has a footprint. There is a basis for global protection of our fundamental rights to that protection. There's a growing system of regulators to enforce and apply that right, and, we are going to be looking to do so.

One caveat, sorry, I'll finish on this, is that, with respect to your presentation, these companies do not need to comply with these various laws and regulations. They are currently operating in Iran, and in many other places, where they're not welcome. They're not in compliance, but they are delivering service s to people, including people at risk on the ground, who needed the services. In that sense, it may be more akin to the top layers of the stack, in that they may decide not to establish offices in local countries, and submit themselves to various jurisdiction, if they find it in the interests of the companies.

I will assert that users at risk in Myanmar are very keen on gaining access to these tools in a way that probably will not ever comply with the local jurisdiction and regulations.

So, I'll leave it there. Thank you.

JOANNA KULESZA: Thank you very much, Peter. There is nothing more comforting to a moderator, than speakers who have differing opinions, that is a discussion readymade. But, just to keep us on track, and I do note that our panelists likely do have direct feedback to the further interventions, I would like to turn the floor over to Berna, and kindly request her assistance with the q&a. There might be questions in the room, which I'm not able to assess, moderating remotely. If there are questions in the chat, or from our remote participants, do feel free to raise your virtual hands, and you will be granted the floor.

BERNA AKCALI GUR: So, if any of our guests on the floor, if you have any questions, you may come to the microphone. At the moment, we do not seem to have any questions. So maybe Joanna, you can start off with your question, and give time to our guests to think about theirs.

JOANNA KULESZA: Right. Thank you. I did notice that Dan would like to directly respond. Dan, do feel free to take the floor.

DAN YORK: Sure. It's great to hear what Berna said, and Uta, and Peter.

I think, Peter, I'm with you on... when I got involved with the Internet Society project, back at the beginning, in late 2021, I naively had this idea., because I had no exposure to satellite information... so, I had this naive idea that, for instance, in Sudan, we could somehow get a terminal into Sudan somehow, and be able to provide it to people, so they could be able to have Internet access, and share information, all this kind of stuff. My naivete lasted until I got talking to people like Berna, and Joanna, about ITU and space law, and the regulations around that.

And, you're absolutely right. Peter is absolutely right, that there is no technical reason why this cannot happen. Starlink can be turned on for every country in the world, at some point, and, on a technical level, that can go on. It's what we see happening in Iran. The challenge, of course, is the legal side, and the reality that it is bounded on the borders, based on this fact that, as Berna talked about, they have to go into each and every country and get approval for the landing rights, for the spectrum, to be able to go for down and up, they have to get a consumer approval, they have to go and do all of that for for each and every country.

And so, it is a case where.... I think you can get away with it, in doing an Iran, because, quite honestly, the rest of the international world is not really going to be too concerned. In fact, they would probably prefer it to be turned on there. However, if you turn it on for other countries and other spaces, you start to get into lots of international pressure, attention, things like that. It just not something you can go and do.

You have some countries such as China, that have been very clear that, if it gets turned on in China, they might take actual activity. They've done wargaming scenarios around what it would take to go and shoot down satellites. There's lots of different pieces that sort of keep that in check at the moment, which to be honest, I was disappointed about, because I was hoping we could be that... get that freedom, get it out there and everywhere.

You also raise the other good point, which is that, unlike a passive... like a geostationary dish for broadcast TV, it's pointed up at a geostationary satellite. It's a one way downlink, it's just receiving the signals, it's just passively getting that. But, once you do this for Internet access, you're doing two way communication, and you do... to Peter's point, you you're exposing that transmitter. In the Ukraine, I know that there have been some of the groups that are there that are making sure that they only turn the transmitters on at certain times, that they put them away. You see pictures of groups of people putting them at a distance, away from where the people are, in case the signal intelligence hones in on where it is and targets it with with a weapon or something. So, you are exposing yourself because it is a two way communication, and that is a critical difference in what we're talking about here.

I also join with Peter and others in that concern about the control of billionaires. It is... right now, it's primarily you're seeing SpaceX, with Elon Musk, you see Project Kuiper, which ultimately is Jeff Bezos, you see those kinds of solutions up there. OneWeb has now been purchased by Eutelsat, so it's now a corporate entity under... and Eutelsat is a French corporate, different things around that, but it's all these bigger players. We don't have what we had in the early days of the Internet, for instance, in the terrestrial based, where you had University networks, hobbyist networks. A

large challenge is just the sheer cost of launching all of this, in some certain way. But lots to be possibly going on in there. I'll defer to others.

JOANNA KULESZA: Thank you. Thank you.

BERNA AKCALI GUR: I would also like to make a short note. As lawyers, we tend to explain what law is, how the regulations apply. That doesn't always represent how we personally think about the matter. So, if you asked me a question about the human rights law approach, then my answer would have had a different perspective on the matters that we have just discussed. As always, we tend to believe that rule of law is important, and that, if you are going to breach the rules, then you are damaging the system as a whole.

Taking these into consideration, my talk was more about explaining how the rules and regulations apply to the satellite broadband tech technology, as it is. Of course, the civil society approach would be different, the human rights law approach would be different, but I didn't include that in my speech. I just wanted to make a little note of that.

JOANNA KULESZA: Thank you very much, Berna. I have a sense that our other panelists might also have something that would like to add something. To check first, if Peter, Uta, Larry have anything to immediately respond, for example, to Dan's comments?

LARRY PRESS: Yeah, all kinds of stuff have been thought provoking. I guess, really... I'll be upfront, I am disappointed and kind of frightened by Elon Musk. He did amazing things, but if you follow him on Twitter, and the stuff that he's starting to post now, it's very political, and it's political in a way that I don't like, so I guess maybe that's... do the rest of you guys have concern about that guy?.

Peter Micek: Yes.

LARRY PRESS: Okay.

Peter Micek: Yeah. I mean, you know, let's get to a place where there's meaningful competition, but within a regulatory framework. I mean, we appreciate innovation. And Larry, I was thinking of your presentation, because you didn't talk about the 90s, which my understanding is when there was a ton of interest in the low Earth orbit sector, and a lot of failures, and so I was wondering if you could..

LARRY PRESS: The one you're probably thinking of is Telesat,. not Telesat ...

DAN YORK: Telus.

LARRY PRESS: What was it called?

DAN YORK: I mean, Iridium, Globalsat. Global...

LARRY PRESS: Oh, no, no, no, no, no, no. Before that.

DAN YORK: Telus

LARRY PRESS: Bill Gates' one.

DAN YORK: Teledesic.

LARRY PRESS: Teledesic, yeah.

But they... it was Bill Gates and a Saudi prince, and a guy who had at the time recently sold a mobile company, they attempted to do this in the in the 90s. But the technology just wasn't there.

I think the main reason it failed.

DAN YORK: And the other point is, it was focused on telecom, it was not necessarily fully focused on providing Internet access at the kind of scale.

I mean, Iridium is still up there, and actually, they're looking at launching a new range of satellites to provide data services and pieces like that. We don't know. A lot of the systems that are being proposed right now, may fail in a similar way. You have to figure out, do you have the business product that's there.

The other part is now, 20 years later, almost 30 years later, I guess, in some ways, you have this enormous change in the capacity of launch systems and mass production of satellites. That's a lot of what's changed today.

LARRY PRESS: I think, Teledesic, they were in fact going for Internet connectivity. Internet was different in those days. It was mostly text. For me it was text-oriented, only uppercase, because I

had a teletype. But, the technology was not up for it, and it just wasn't economically viable. The satellite technology, the launch technology, it couldn't have been at the time.

JOANNA KULESZA: Thank you, Larry. Thank you so much. We do have a question from Mike, before I hand the floor over to Uta. Please, just let me read out the question, it just might be that you would like to reference that question as well. The question from Mike reads, "Radio spectrum access is regulated to prevent interference, and allow coordinated usage. However, in the optical domain, there is effectively no interference that would warrant regulation. What tensions could we see from governments, trying to extract fees from the optical spectrum?" If you wish to address that question directly, Uta, do feel free to do so. Do take the floor, and then I will ask our other panelists if they wish to address Mike's question directly.
Uta, please, the floor is yours.

UTA MEIER-HAHN: Thank you. Very much appreciate the question, at the same time, I find it very far-reaching, and, at this moment, a little bit beyond the level of discussion at this stage of development, but also, it's something that I would want to think about, frankly.

I have also been asked, so, what are possible avenues, if we acknowledge, or if we all establish together, that there is an importance of some kind of multistakeholder input into the further development of this industry, and possibly policy options, and what could be things that we could be doing. I just wanted to throw a couple of things in the room, so maybe those can be picked up by people who listen here.

For one, of course, there's an option to hold listening sessions by all the providers and future providers of the systems. This, of course, includes the EU, but maybe also the other providers could be interested. It would certainly go a long way towards providing some transparency into their system, which, as this session exemplifies, could be demanded, and it would give the public an opportunity to have their views heard.

Another important thing could be to also talk to financing and investment opportunities, and see what the ways of support, having, for instance, blended finance impact investors come in to support satellite Internet from space in the countries that currently cannot, or have not, afforded it so far.

We should, and could document the best practices, in terms of regulatory approaches.

Also, with regard to how do these companies that do exist, and the countries that do want to be customers, how can they do a quick onboarding, and how can they activate the services quickly?

There's another aspect of really doing research, like financing research about this, because, as we've probably all seen in our preparation for the session, there is not so much empirical evidence with regard to many of the important questions of this topic.

There may be an opportunity for some countries to think about twinning programs, to move together on forward on this topic.

And, specifically, with regard to IRIS Square, I feel like it's worth throwing in the room, that, depending on the views that are being held from the finances of this constellation, and the populations that sat behind them, there may be an opportunity to also think about connectivity from space as an in kind sort of development services, if you will. So, not only providing countries with the capacity building they need to set up their institutions, etc.,but also to really directly just provide that connectivity. I'm not sure if that's been done much before, but it could certainly be an avenue.

And then, certainly, there's coalition building in general, just to foster the interest of this very large common consumer group. Thank you.

JOANNA KULESZA: Wonderful, thank you very much, Uta. I'm curious if any of our speakers might have an answer for Mike, as well. That seems a really interesting question. I do agree that it's an early stage in development for the optical spectrum infrastructure in governmental...

Yes, Dan, please go ahead.

DAN YORK: I think it's a good question. The basic point is that, if you're doing optical conductivity, it's a direct connection, it's not shared, as Mike said. I think it's really early, I think we have to see where these things get proved out. Larry provided a great overview of a lot of the different work that's happening in this space to ground connectivity, and what's what's going on in that, but I think we've still got a bit to go.

To Mike's point, it's probably good to be thinking about that in advance, so that these things don't get trapped into regulatory capture, or wind up with great impediments to doing that, but I think we're still early.

LARRY PRESS: With respect to how to subsidize it and whatnot, to some extent I think that takes care of itself. If the people in an area, people in a nation, can't afford connectivity to, say, SpaceX, or to one of these little things, to the extent that that that will mean they have excess capacity over that nation.

I remember when Elon Musk first did, he came out and said, Hey, we're going to charge the same price everywhere. And that was crazy, because it makes no sense. You want to charge a price that will use up your entire available capacity. So, to some extent, just the economics of it take care of kind of the different income levels of different countries in different regions.

Makes sense? It's come to pass, he definitely charges different rates in different countries.

JOANNA KULESZA: Great. Thank you very much, Larry. I'm just going to quickly check if any of our panelists would like to add anything to the session. We're about to wrap up, and before I do so, just going to check if anyone would like to add anything we might have missed, or there's any direct feedback from the room.

Berna, please, go ahead.

BERNA AKCALI GUR: Just to add to those points. Well, we overlap, but what would we advise to the developing country. I want to refer back to our policy paper, and quickly list what we had recommended them, to effectively use this technology. So, we recommended them to reevaluate and update domestic regulations related to licensing and authorizing satellite broadband services, to consider the different business models and the impact on their autonomy when deciding on gateways, for example, and we recommended forming regional alliances to enhance achievement of their local policy goals. We also recommended them to participate actively in the ITU consultations, especially in the ITU-R which manages frequency spectrum and orbital resources. Again, if this is done through regional alliances, as they are doing now, it will enhance their chances of achieving their desired outcomes.

Also, they should reassess their commitments under trade treaties. They are not set in stone, they could be renegotiated. These should be considered, with their renewed interests and priorities associated with this technology.

Also familiarize themselves with space law, wwhich hasn't been of interest to many non-spacefaring nations, I think awareness of rules is essential to make informed decisions.

A holistic concentration of these actions, I think, is necessary to ensure that their initiatives align with their sustainable development goals.

JOANNA KULESZA: Thank you very much. Dan, please go ahead.

Dan Yor: Sure. One thing I want to say about the panel, I just want to say to Uta that I loved her points that she had, because I think you very succinctly summarized really some of the key issues and points around here. I would add a point, the robustness, the resiliency, is something that we've seen as a critical part.

I'm a volunteer, here in the United States, for an organization called the ITDRC, which is the IT Disaster Resource Center, and they have been deploying into places like Florida, when there was Hurricane Ian, and also into the wildfires that were going on out in the western part of United States, and they can take a satellite dish on a pickup truck, for instance, and be able to bring it in and provide Wi-Fi connectivity for the first responders, and other people who are in the incident command area.

It's a kind of ubiquitous connectivity that we have never had access to before. It's just mind blowing, in what it can do and the kind of spaces around that. So I think, for all the challenges, there's an amazing amount that it can do, in the right ways. We need to figure out how to get it right.

I would also point to what Berna just mentioned, that a lot of us in the Internet space, if we interact with the ITU, we primarily interact with the ITU-T, the telecommunication sector, or the ITU-D around development, we don't do as much historically with the ITU-R, the radio telecommunication side. But, that's where all of this happens in satellites, because of the spectrum, and people should pay attention to the World Radio Congress coming up next November here, November, December, because that will be, every four years, the gathering of people to talk about this. While Leo's aren't directly on the agenda, there are side conversations, there's other places, there's things that will be paying, so I would encourage people to pay attention to that.

My final point would just be, we need to have more of these conversations, because this is this new emerging field, there's a lot of satellites going to be launched over the next while, that's happening. We need to collectively make sure that we can get it right, to a degree that we can, from a societal point of view. I encourage everybody read Berna's document that was in there,

read our LEOs document, read other documents, and share this, get people talking about it, because we have to be talking about these questions.

JOANNA KULESZA: Great. Thank you, Peter, do go ahead.

Peter Micek: Quickly. Thanks. To sort of piggyback and reinforce Dan's comments, we need to have more conversations. As civil society, we are heavily dependent on governments in this space. Governments are putting forward a lot of the funding necessary. They're going to be doing a lot of the procurement, including through their defense industries and defense spending. Presumably, they're the ones talking to these companies.

I'm a very privileged person, white male in the US, I know the public policy director for SpaceX, and I can't get any my calls returned. So, I think, just to underscore that, like, what an asymmetrical disadvantage we're at, when we're trying to influence public policy in this space, that we are heavily dependent. Governments seemed to be in a lot of competition over this sector.

But, I'm buoyed by things like, yesterday, the Freedom Online Coalition launched these, called, Donor Principles on Human Rights in the Digital Age, and I think those are getting at ways to harmonize and raise standards around government procurement and support for new and emerging technologies, and should urgently be applied to this space.

JOANNA KULESZA: Great, thank you very much, Peter.

I could do nothing more but to strongly support all the points that have just been made. We do need to have more of these conversations, and I do welcome the significant presence of LEOs on the agenda of the IGF. It is a theme that the multistakeholder community should pay attention to, before it's too late, as our speakers have emphasized during this panel.

We are out of time, so I will refrain from summarizing the panel more thoroughly. Thank you very much for joining us. sincerest thanks to our speakers. Thank you for all the points that you guys have made. Thank you for being here, both virtually and in person, and to those of you who are in the room, or online, joining us, do feel free to reach out to the speakers directly and share your feedback, because this is the time to do LEOs policy that serves the broader Internet community.

Thank you everyone. With this, the session is adjourned.